

# Parental education on passive smoking in infancy does work

M.R. CRONE, S.A. REIJNEVELD, M.C. WILLEMSSEN, R.A. HIRA SING \*

**Background:** Passive smoking is harmful to young children. A protocol has been developed to allow health care workers to communicate with parents about preventing passive smoking. The main message was to refrain from smoking in the presence of the child. The aim of the study was to assess the effectiveness of this education programme. **Method:** The prevalence of smoking in the presence of infants aged 0–10 months was compared before and after the implementation of the education programme. National samples of mothers completed questionnaires in 1996 (n=1,129) and in 1999 (n=2,534). Questions were asked about smoking in the living room in the presence of infants, and about parental smoking, and background characteristics. **Results:** The prevalence of passive infant smoking decreased from 41% to 18%. The adjusted odds ratio for passive infant smoking in 1999 compared to 1996 was 0.34 (0.26–0.44) when none of the parents smoked, 0.19 (0.14–0.27) when one of the parents smoked, and 0.30 (0.20–0.44) when both parents smoked. **Conclusion:** The implementation of this health education programme seems to have been very successful in reducing passive smoking in children. Implementation of similar health education programmes in other countries is recommended.

**Keywords:** children, education programme, passive smoking

Passive smoking can have harmful consequences for babies and young children. Children spend most of their time in the presence of their parents. If parents smoke, the children will be exposed to tobacco smoke for long periods.<sup>1</sup> Children who are exposed are at risk of a range of health problems: they are more likely to have otitis media or wheezing, adenotomies, tonsillectomies and, during a Respiratory Syncytial Virus epidemic, to contract bronchiolitis.<sup>1–6</sup> There is also a dose-dependent relationship between sudden infant death and passive smoking.<sup>7,8</sup> Furthermore, passive smoking is associated with excessive infant crying.<sup>9,10</sup>

Mothers often smoke less during pregnancy than they used to. Some women actually stop smoking during pregnancy, but after delivery they relapse into their previous smoking habits.<sup>11</sup> This relapse is partly caused by the fact that women do not realize that passive smoking can be dangerous for the child.<sup>11</sup> A Dutch study conducted in 1992 indicates that in 44% of households, people smoked in the presence of the child in the living room and that, in 12% of households, people smoked in the car in the presence of the child.<sup>12</sup> Data about the prevalence of passive smoking in other western European countries are sparse. Only in northern European countries has the prevalence of passive smoking in childhood been studied more intensively: a study among parents of children born

in 1992 in Finland, Sweden, Norway, Finland, Iceland and Denmark showed that the prevalence of passive smoking is, respectively, 7%, 15%, 32%, 46% and 47%.<sup>13</sup> A European project on smoking cessation in pregnancy (Euro-scip) showed that about 50% of all new-borns and young children in Germany and Ireland grow up in a household where at least one person smokes. Only in Sweden is this proportion much lower in families with young children, with only 10% of mothers and 12% of fathers smoking.<sup>14,15</sup>

In the Netherlands, it was concluded that parental education is needed to reduce the prevalence of passive smoking in infancy.<sup>12</sup> Well-baby clinics were chosen to deliver this programme because of the frequent contacts of parents and children with this type of preventive health care. Doctors and nurses in the well-baby clinics offer preventive childcare for 0–4 year olds. Approximately 97% of Dutch infants visit a well-baby clinic regularly. During the pre-school period, parents and children may attend the child health clinic about 10 to 14 times.<sup>16</sup>

## PREVENTION OF PASSIVE INFANT SMOKING BY WELL-BABY CLINICS

According to a study in 1994, most nurses and doctors in the well-baby clinics thought it was their task to give education on passive smoking in infancy (78%). However, only a small percentage did so (27%). Barriers to giving education on passive smoking were that they lacked time and did not have information materials on this subject.<sup>17</sup>

To provide such materials, Defacto and TNO Prevention and Health developed, in 1996/1997, an education programme on passive smoking in infancy titled 'Smoking?

\* M.R. Crone<sup>1</sup>, S.A. Reijneveld<sup>1</sup>, M.C. Willemsen<sup>2</sup>, R.A. Hira Sing<sup>3</sup>

<sup>1</sup> TNO Prevention and Health, Leiden, The Netherlands

<sup>2</sup> Defacto for a Smoke Free Future, The Hague, The Netherlands

<sup>3</sup> Department of Social Medicine, Institute for Research in Extramural Medicine, VU University Medical Centre, Amsterdam, The Netherlands

Correspondence: M.R. Crone, TNO Prevention and Health, P.O. Box 2215, 2301 CE Leiden, The Netherlands, tel. +31 71 5181899, fax +31 71 5181920, e-mail: mr.crone@pg.tno.nl

Not in presence of the little one'. The education programme consisted of a leaflet for parents and a manual for health professionals. These materials were developed on the basis of an inventory of available prevention programmes, a study of the factors influencing passive infant smoking and the theoretical construct Stages of Change.<sup>18</sup>

#### ■ Inventory of available prevention programmes

At the start of the development process, an inventory was made of the available programmes. This showed that the counselling programme of Strecher *et al.*<sup>19</sup> was particularly successful, mainly because it aimed at increasing parental self-efficacy regarding the prevention of passive infant smoking and not at parental smoking cessation. This American programme, however, took four home visits of 45 minutes each, whereas in the Dutch well-baby clinics about 10 minutes are available for each visit. Additionally, Dutch opinion towards smoking differs from the American opinion in such a way that different factors may be relevant for the prevention of exposure to tobacco smoke.

#### ■ Factors influencing passive infant smoking

To obtain information on factors relevant to the prevention of passive infant smoking in the Netherlands, a study was conducted on the behavioural factors influencing passive smoking in infancy, in 1996.<sup>20</sup> This study suggests that health education efforts should focus on the attitudes and self-efficacy of parents, and in particular on the health consequences of the exposure of young children to tobacco smoke. Special attention should be paid to smokers with a low educational level. The results also indicated that education should strengthen the ability of non-smoking parents to deal with smokers.<sup>20</sup> The conclusions of this study were used in the development of the education programme.

#### ■ Stages of Change construct as theoretical basis

The Stages of Change construct was used as the theoretical basis of the programme<sup>18</sup> because the 1996 study showed rather large differences between groups of parents regarding their preventive behaviour in passive infant smoking.<sup>11</sup> This construct provides a conceptual framework to cope with variations in the motivational stages of persons by means of tailored education. This means that some persons need more education than others. The model distinguishes the following phases: precontemplation, contemplation, preparation and action, and maintenance. In the case of passive smoking, some parents are not at all aware of the negative consequences of passive smoking in infancy (precontemplation phase). Some parents are already aware of the consequences but do not know how to handle it (contemplation phase). Again, some other parents have already taken some action to prevent passive smoking (preparation and action phase), and parents in the last phase have to continue their behaviour (maintenance phase). These phases need different kinds of educational approaches.

To be able to give tailored education on passive infant smoking a five-step procedure was developed for health professionals to discuss the subject. The five steps were:

- 1) assessing the occurrence of smoking at home and in the presence of the child.
- 2) discussing the possible health consequences of passive smoking.
- 3) assessing the readiness of parents to prevent passive smoking and discussing possible house rules.
- 4) discussing and taking away barriers during the implementation of the house rules.
- 5) Following-up the implementation and maintenance of the house rules.

The health professionals were advised to follow the first two steps of the procedure at the first contact with the parents, then the other two steps in the following contact and to follow-up regularly. Steps 3, 4 and 5 depended on the opinions, knowledge, motivation and skills of parents regarding passive infant smoking. Parents who are in the precontemplation phase of the Stages of Change construct need much more attention from health professionals during these steps than parents in the preparation and action phase. The main message of the education programme was that parents should refrain from smoking in the presence of the child. In the leaflet for parents all five steps are discussed.

#### *Dissemination and implementation*

In 1997, the education programme was disseminated in three phases to all Dutch well-baby clinics and all parents. The first phase was directed at doctors and nurses in the well-baby clinics. The materials of the education programme were mailed to each clinic, and all were offered a free-of-charge training. In this training the education programme was explained and nurses and doctors could practise the education in role-plays. The second phase of the dissemination was directed at parents of young children. In March 1998 the Dutch Minister of Health started this campaign and at the same time attractive materials (posters, stickers, etc.) were mailed to nurses and doctors in the well-baby clinics. Local radio stations received a recorded interview that they could use for an item on passive infant smoking. Articles were published in magazines for (pregnant) parents. The third phase was directed at family and friends: during one month in 1999, a TV-spot on passive infant smoking was broadcast regularly and this was repeated in 2000.

#### *Evaluation*

The aim of the present study was to assess the effectiveness of the education programme 'Smoking? Not in presence of the little one'. The prevalence of smoking in the presence of infants aged 0–10 months before (in 1996) and after the implementation of the programme (in 1999) was compared.

## METHODS

#### *Data collection*

In 1996 sixteen home-care organizations were asked to participate in the study, one from each of the four major cities of the Netherlands (Amsterdam, Rotterdam, The Hague and Utrecht) and one from each Dutch

province.<sup>11</sup> The Dutch well-baby clinics form a part of the home-care organizations. Fourteen organizations agreed to participate: the four major cities and 10 provincial associations. Each organization was asked to make a random selection of five well-baby clinics according to a specific procedure. Each of these clinics issued a questionnaire to the first 40 parents with a baby aged 1 to 14 months who visited the well-baby clinic and agreed to take part in the study. Parents were excluded if they could not read or write Dutch. The home-care organizations received 2,800 questionnaires and eventually distributed 2,720 questionnaires, which the parents filled out at home. In total 1,715 parents completed the questionnaire (response 63%). For this study only the questionnaires completed by mothers with an infant aged 0 to 10 months were selected (n=1,129). The average age of mothers was 31 years and the average age of partners was 33 years. The average age of mothers was slightly higher than the average age of mothers with newly born children in the Netherlands.<sup>21</sup> Twenty-seven per cent of the mothers had a high educational level. This is slightly higher than the percentage in the overall distribution of the educational level for women in the Netherlands (22%).<sup>11,22</sup>

In the survey of 1999 all home-care organizations in the Netherlands (N=66) were asked to randomly select four to five well-baby clinics. The home-care organizations could give the number of questionnaires that they wanted to distribute among mothers with an infant aged 0 to 10 months in each selected well-baby clinic. Eventually 39 home-care organizations (including the four major cities) participated with 170 well-baby clinics. They received 3,755 questionnaires in total and 2,534 mothers returned the questionnaire (response 67%).<sup>23</sup> Data on parental education and age were not included in this study. Therefore a comparison with the total Dutch population regarding these characteristics was not possible.

Data on birth weight of the child, age of the child (in months), order of the child in the family, and gender of the child were asked for in both studies. The two groups of respondents did not differ regarding these characteristics ( $p>0.05$ ).

In both studies the written information accompanying each questionnaire assured parents of anonymity and confidentiality. Their names were not requested. The parents were asked to complete the questionnaire at home and to return it in a stamped addressed envelope.

#### Data

Both surveys asked for parent-reported smoking in the living room in the presence of infants by parents and visitors in the seven days before completing the questionnaire (hereinafter: passive infant smoking), together with maternal and paternal smoking and background characteristics. It was decided to use parent-report on passive infant smoking for two reasons. First, biological measures, like the assessment of cotinine concentrations, are difficult to implement in community studies. Second, biological measures may cause more bias than self-reported measures. Many parents refuse these

measures, causing 'strong' selection bias, and if not refused their use may in itself change parental behaviour. A recent review by Hovell *et al.* indicates regarding the association between biological and reported measures that: 'The consistency in direction of these associations across independent studies is reassuring and suggests that reported measures can be satisfactory indicators of exposure. This conclusion is bolstered by the observation that relationships between reported measures and biological indicators are about the same between biological and environmental measures'.<sup>24</sup> These arguments both favoured the use of self-report to measure passive infant smoking.

#### Analysis

In all analyses, both datasets were used. It was first assessed whether the prevalence of passive infant smoking changed between 1996 and 1999, among infants aged 0–10 months. These analyses were repeated with adjustment for all background characteristics that were included in both datasets, birth weight of the child, age of the child (in months), order of the child in the family, and gender of the child. Finally, it was assessed whether changes between 1996 and 1999 differed for smoking and non-smoking parents by including the interaction term of parental smoking with the year of measurement. All analyses were done with logistic regression using SPSS version 10 for Windows.<sup>25</sup>

#### RESULTS

The prevalence of passive infant smoking decreased between 1996 and 1999, from 41% to 18% (*table 1*). The prevalence of maternal smoking also decreased slightly (from 24% to 20%).

The prevalence of passive infant smoking decreased between 1996 and 1999 with statistical significance [odds ratio (OR), (95% confidence interval (CI)): 0.32 (0.27–0.37)]. Parental smoking and several background characteristics were associated with passive infant smoking (*table 2*). Adjustment for differences between the 1996 and 1999 groups yielded very similar results, showing that none of these confounded the change in prevalence of passive infant smoking between these years. However, the change in passive infant smoking between 1996 and 1999 differed according to parental smoking status (*table 2*): the p-value for the inclusion of this interaction was 0.031. We therefore computed ORs for passive infant smoking in 1999 compared to 1996 separately for three subgroups: families in which none, one and two parents smoked. This analysis was repeated with adjustment for age of the child. Adjusted results showed that changes were relatively larger among families in which one parent smoked (*table 2*).

#### DISCUSSION

This study shows that the prevalence of passive infant smoking in the Netherlands more than halved after the national implementation of an education programme aiming at (its) reduction. The change was largest when

only one parent smoked. It was expected that the highest passive infant smoking rate before the education programme had the greatest potential for change: this was the case when both parents smoke. Passive infant smoking did decrease in this group but not as much as among parents with just one smoker. An explanation may be that it is more difficult to change behaviour when both parents smoke than when just one parent smokes: the non-smoking parent can support and motivate the smoking parent in maintaining non-smoking behaviour in the presence of the child. Nonetheless a large decline in passive infant smoking also occurred when both parents smoked.

It seems likely that the observed decrease in passive smoking has been caused by the intervention. No other health education campaigns on this subject were active during this period. Levels of passive infant smoking in 1992 resembled those in 1996.<sup>12</sup> Therefore, a process already started before 1996 could not explain the decline in 1999. Furthermore, the overall prevalence of smoking hardly changed during this period. In 1996, 32% of women smoked and 39% of men, in 1999 it was respectively 31% and 37%.<sup>26</sup> Differences between the 1996 and 1999 samples and between the samples and the general Dutch population could also not explain the decline. Samples hardly differed from each other regarding birth weight of the child, age of the child, order of the child in the family and gender of the child: after adjustment for these characteristics, the results were very similar. Nonetheless, the mothers in the 1996 sample were older and more highly educated than mothers in the general Dutch population. This could have influenced the prevalence rate of passive infant smoking, but one would expect that the prevalence rate of passive infant smoking in 1996 would normally have been higher. Data on education and age of the mother were not available for the 1999 sample. The 1999 sample, however, did not differ from the general Dutch distribution regarding the order of the child in the family, regarding gender, and regarding birth weight of the child. Despite this, we cannot exclude some degree of selection bias in

both samples, but think that this cannot explain the large effect found.

Furthermore, these findings could also be due to a trend that is going on in all countries in western Europe. Unfortunately, few European data are available to verify this explanation, as in most countries no subsequent comparative assessments are available. Such data was found for two Nordic countries, Norway and Sweden. In Norway, Andersen and co-workers found a decrease in the exposure of children to tobacco smoke from 32% in 1995 to 18% in 2001. They assume that a national information campaign called 'Smoke-free Environment for Children - George the Giraffe' caused this decrease. This campaign targets children in the age group 0–9 and their parents. It focuses on three areas: maternity wards, mother and child clinics and school and after-school activities (M. Andersen, written communication). In Sweden, a counselling method based on Bandura's self-efficacy concept was developed, called 'smoke-free children'.<sup>27</sup> It studied the development of parental smoking before and after the introduction of this counselling method. After training child health nurses, the annual decrease was 1.7% in parental smoking in the pilot area and later, when

**Table 1** Prevalence of passive infant smoking by background characteristics, in 1996 and 1999

	Passive infant smoking			
	1996		1999	
	N <sup>a</sup>	Passive infant smoking %	N <sup>a</sup>	Passive infant smoking %
Maternal smoking status				
Non-smoker	846	32	2030	12
Smoker	263	70	503	40
Paternal smoking status				
Non-smoker	711	28	1693	12
Smoker	351	64	813	30
Parental smoking status				
Both parents do not smoke	654	24	1547	9
One of the parents smoke	279	61	641	25
Both parents smoke	178	72	345	42
Age of the child				
0–3 months	458	40	1023	13
4–6 months	398	41	884	21
7–10 months	253	44	626	21
Birth weight of the child				
Less than 2500 grams	53	51	137	23
2500–3499 grams	524	44	1128	20
3500 grams or more	494	36	1188	16
Order of child in family				
First child	541	40	1203	16
Second child	390	41	904	19
Third or subsequent child	174	43	420	20
Gender of the child				
Boy	526	41	1297	17
Girl	577	41	1236	19
Total	1,129	41	2,534	18

a: Numbers do not add up to 1,129 (1996) or to 2,534 (1999) due to missing values.

the method was introduced in the county as a whole, 2.7% in the remaining parts.

In the analyses, we could not adjust the results for all potentially relevant social demographic variables, like parental education, parental age and/or marital status explicitly. The latter variables were included in the 1996 questionnaire but not in the 1999 one. Maternal educational level in particular may be associated with prevention of passive infant smoking. In 1996 the prevalence of passive infant smoking was lowest (25%) among mothers with a high educational level. Therefore we assessed the potential effect of selection bias regarding this by simulating a worst-case scenario: 'What if in 1999 only the high educated mothers participated in the study? Might this explain the effect as found instead of the intervention?' We therefore compared the prevalence of

passive infant smoking among high-educated mothers in 1996 with that of the total group in 1999. Even in this, unlikely, scenario there would be a real decrease in passive infant smoking of 7%.

In both studies the participating home-care organizations were well spread over the Netherlands. But nonetheless, the mothers in the study of 1996 were a little older and higher educated than the average mothers in the Netherlands at that time.

Underreporting of smoking in the presence of the child could cause a spurious decline, since almost all parents could be expected to know about the harmful effects by 1999. This cannot be excluded but it seems unlikely that such an underreporting would explain the large decline observed. Moreover, the study is concerned with a similar measurement before and after a population-based inter-

**Table 2** Prevalence of passive infant smoking: odds ratios comparing 1999 with 1996, and comparing categories of relevant background characteristics

	N <sup>a</sup>	Crude OR <sup>b</sup>	p-value <sup>c</sup>	Adjusted OR <sup>d</sup>	p-value <sup>c</sup>
Year of measurement			<0.001		<0.001
1996 <sup>e</sup>	1068	1		1	
1999	2448	0.32 (0.27–0.37)		0.34 (0.26–0.43)	
Parental smoking status			<0.001		<0.001
Both parents do not smoke <sup>e</sup>	2126	1		1	
One of the parents smoke	886	3.58 (2.98–4.29)		5.58 (4.09–7.60)	
Both parents smoke	504	6.92 (5.61–8.55)		8.28 (1.28–1.98)	
Age of the child			<0.001		<0.001
0–3 months <sup>e</sup>	1436	1		1	
4–6 months	1232	1.33 (1.12–1.59)		1.42 (1.17–1.73)	
7–10 months	848	1.41 (1.16–1.70)		1.59 (1.28–1.98)	
Birth weight of the child			<0.001		
Less than 2500 grams	190	1.16 (0.84–1.61)			
2500–3499 grams <sup>e</sup>	1650	1			
3500 grams or more	1676	0.75 (0.64–0.87)			
Order of child in family			0.146		
First child <sup>e</sup>	1692	1			
Second child	1256	1.15 (0.97–1.35)			
Third or subsequent child	568	1.19 (0.96–1.48)			
Gender of the child			0.227		
Boy	1766	0.91 (0.78–1.06)			
Girl <sup>e</sup>	1750	1			
Parental smoking by year of measurement (interaction effect) <sup>f</sup>					
Both parents do not smoke			<0.001		<0.001
1996 <sup>e</sup>	628	1		1	
1999	1498	0.33 (0.26–0.42)		0.34 (0.26–0.43)	
One of the parents smokes			<0.001		<0.001
1996 <sup>e</sup>	270	1		1	
1999	616	0.21 (0.16–0.29)		0.19 (0.14–0.27)	
Both parents smoke			<0.001		<0.001
1996 <sup>e</sup>	170	1		1	
1999	334	0.29 (0.20–0.43)		0.30 (0.20–0.44)	

a: Numbers do not add up to 3,663 due to missing values.

b: OR= odds ratio, 95% confidence interval.

c: p-value for inclusion of the characteristics in the logistic model.

d: Adjusted for all other characteristics that are mentioned in the table (year of measurement, parental smoking, parental smoking by year of the measurement, order of the child in the family, age, birth weight and gender of the child).

e: Reference category.

f: Crude and adjusted for all other background characteristics mentioned above.



vention. Even if it was imperfect, it would only yield biased results regarding the effect of the intervention if measurement errors before and after the intervention are different. There is no evidence for this and we therefore think it justified that in this study, self-reported smoking in the presence of the child in the living room is a valid measure for the effect of parental education about passive smoking on parental behaviour.

The study thus shows a rather large change in parental self-reported behaviour. This corresponds to the findings of Hovell *et al.*<sup>28</sup>, who observed positive effects of seven counselling sessions for mothers by graduate students (three in person and four by telephone). It also corresponds to the findings of Emmons *et al.*<sup>29</sup>, who observed positive effects of a home visit of 30 to 45 minutes followed by three calls of approximately 10 minutes each. However, our results show that less intensive counselling can be equally effective. We think that a main reason for the relatively large effect found is that the programme has been integrated in the routine activities of the well-baby clinics and that the attendance rates of these clinics are high. Regarding the integration in routine care, it was recently shown that 71% of nurses in the well-baby clinics joined the programme.<sup>30</sup> Andersen and co-workers found similar large effects for the aforementioned Norwegian programme, which has also been integrated in routine activities with high attendance, such as routine care at maternity wards and at mother and child clinics. The implementation of this health education programme at well-baby clinics has thus been highly successful. It seems likely that such a change in behaviour will have an impact on the incidence of health problems related to passive smoking in infancy. We therefore recommend the further implementation of similar, structured health education programmes in other countries.

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Received 28 January 2002, accepted 16 May 2002